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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/596,000

01/17/2007

Hiroyuki Kanbara

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EXAMINER

EOFF, ANCA

ART UNIT

PAPER NUMBER

1722

NOTIFICATION DATE

DELIVERY MODE

03/11/2011

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/596,000	<b>Applicant(s)</b> KANBARA ET AL.	
	<b>Examiner</b> ANCA EOFF	<b>Art Unit</b> 1722	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 02 March 2011.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 20,22-29,31 and 33-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 20,22-29,31 and 33-38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>03/02/2011</u> .  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on March 02, 2011 has been entered.
2. The indicated allowability of claims 20, 22-29, 31 and 33-38 is withdrawn in view of the newly discovered reference Sugiura et al. (JP 2002-270036). Rejections based on the newly cited reference follow.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 20, 22, 23, 25-27, 29 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiura et al. (JP 2002-270036, with a machine translation of the document attached) in view of Felten (US Patent 4,598,037).

With regard to claims 20, 26 and 29, Sugiura et al. teach a photocuring conductor paste comprising:

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- 75-90% by weight of a conductive powder material (par.0029 and par.0011), and

- 10-30% by weight of an organic vehicle (par.0029).

The organic vehicle comprises a photopolymerizable compound and a photopolymerization initiator in an amount of 0.1-30% by weight of the photopolymerizable monomer (par.0019 and par.0025). The organic vehicle may also comprise a polymeric binder in an amount of less than 10% by weight of the photopolymerizable monomer (par.0025).

The photopolymerizable monomer of Sugiura et al. is equivalent to the photosensitive monomer of claim 20 and the polymeric binder of Sugiura et al. is equivalent to the polymer of claim 20 of the instant application.

Sugiura et al. do not specifically teach the photosensitive paste of claim 20 of the instant application.

However, it would have been obvious to one of ordinary skill in the art at the time of the invention to obtain the paste of claim 20, based on Sugiura's teachings regarding the components of the paste and the amount of each component.

If the photopolymerization initiator is about 10% by weight of the photopolymerizable monomer (see Embodiments 1 and 2 in par.0034-0035) and the binder is 5% by weight of the photopolymerizable monomer (see par.0025), then the organic vehicle comprises:

- 87% by weight of the photopolymerizable monomer,
- 8.7 % by weight of the photopolymerization initiator and

-about 4.3 % by weight of the binder.

In this case, the ratio of a photopolymerizable monomer / (photopolymerizable monomer + binder) = 0.952, which satisfies the limitation of the ratio of photosensitive monomer/ (photosensitive monomer + polymer) of 0.90 or more of claim 20.

If the photosensitive paste contains 75% by weight of conductive powder and 25% of the organic vehicle (with 87% by weight of the photopolymerizable monomer, 8.7 % by weight of the photopolymerization initiator and about 4.3 % by weight of the binder), the paste comprises:

- 75% by weight of conductive powder, which is within the range for conductive powder of claim 20,

-about 22% of the photopolymerizable monomer, which is within the range of claim 20 for a photosensitive monomer, and

-about 2% of the photopolymerization initiator, which is within the range of claim 20 for a photopolymerization initiator.

Therefore, the conductor paste of Sugiura et al. is equivalent to the photosensitive paste of claim 20 of the instant application.

The conductor paste of Sugiura et al. is used for forming a film by exposure and does not need a solvent removing step after application (abstract).

Sugiura et al. teach a process of making a film, said process comprising steps of applying the paste on a substrate, exposing for curing the paste and baking the cured film (abstract) but do not teach a process of forming a pattern.

However, it is well-known in the art that a conductive paste may be used for obtaining fine lines and spaces by:

- applying a layer of conductive material to a substrate by means of dispersion in a photosensitive medium;
- exposing the layer imagewise to actinic radiation;
- solvent developing the pattern to remove unexposed portions of the layer, and
- firing the remaining exposed portions of the pattern to remove all the organic material and to sinter the inorganic material (see Felten, column 1, lines 40-50).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the paste of Sugiura et al. in a process of forming fine lines and spaces, as taught by Felten, in order to take advantage of the fact that the conductor paste of Sugiura et al. does not need a solvent removing step after application on the substrate.

The step of "applying a layer of conductive material to a substrate by means of dispersion in a photosensitive medium" (see Felten, column 1, lines 43-44) is equivalent to the step of "applying to a support a photosensitive paste so as to form a photosensitive paste film" of claim 20 of the instant application.

The step of "exposing the layer imagewise to actinic radiation" (see Felten, column 1, line 46) is equivalent to the step of "subjecting the photosensitive paste film to an exposure treatment" of claim 20 of the instant application.

The step of "solvent developing the pattern to remove unexposed portions of the layer" (see Felten, column 1, lines 46-47) is equivalent to the step of "developing the photosensitive paste film subjected to the exposure treatment so as to form a thick film pattern" of claim 20 of the instant application.

The solvent developing step (see Felten, column 1, line 47) meets the limitation of claim 26 of the instant application.

The step of firing the remaining exposed portions of the pattern to remove all the organic material and to sinter the inorganic material of Felten (column 1, lines 48-50) meets the limitations of claim 29 of the instant application.

With regard to claim 22, Sugiura et al. teach that the paste may comprise photopolymerizable compounds, such as trimethylolpropane triacrylate, dipentaerythritol pentaacrylate, dipentaerythritol hexaacrylate (par.0021), which are equivalent to the photosensitive monomers having a double bond concentration within the range of 8 to 11 mmol/g.

With regard to claim 23, Sugiura et al. teach that the paste may comprise photopolymerizable compounds such as triethylene glycol diacrylate (par.0021), which meets the limitation for a "photosensitive monomer having an ethylene oxide structure with a degree of polymerization of about 3 or less".

With regard to claim 25, Sugiura et al. teach that the paste is substantially solventless or contains less than 5% by weight of a solvent (par.0009).

With regard to claim 27, Felten teaches that the paste forms a pattern by imagewise exposure with actinic radiation (column 1, lines 43-46), which is equivalent to the exposure treatment with a photomask of claim 27.

Felten does not show that the mask is in contact with the paste. Therefore, it is the examiner's position that the limitation of claim 27 for "the photomask is kept from contacting the photosensitive paste film in the exposure step" is met.

With regard to claim 37, Sugiura et al. teach that the paste may comprise photopolymerizable compounds, such as trimethylolpropane triacrylate, dipentaerythritol pentaacrylate, dipentaerythritol hexaacrylate (par.0021). These monomers have double bond concentration within the range of 8 to 11 mmol/g (see page 19 of the specification of the instant application), which overlaps the range of 7.01 to 10.38 mmol/g of claim 37.

The conductive powder of Sugiura et al. is not provided with an inorganic coating (see par.0016-0018).

5. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiura et al. (JP 2002-270036, with a machine translation of the document attached) in view of Felten (US Patent 4,598,037) as applied to claim 20 and in further view of Kubota (US Patent 6,531,257)

With regard to claim 24, Sugiura modified by Felten teach the method of claim 20 (see paragraph 4 above) and Sugiura et al. further teach that the paste may be exposed with ultraviolet (par.0031).

However, Sugiura and Felten fail to teach that the paste comprises an UV absorber.



Kubota teaches a photosensitive paste (abstract), wherein the paste may be exposed in ultraviolet with a high-pressure mercury lamp (column 10, lines 1-2).

Kubota teaches that by mixing an ultraviolet absorber, the absorptivity of exposure light can be improved and the exposure failure due to light scattering can be minimized (column 4, lines 29-32).

Therefore, it would have been obvious to include the UV absorber of Kubota in the paste of Sugiura modified by Felten, in order to improve the absorptivity of exposure light and to minimize the exposure failure due to light scattering.

6. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiura et al. (JP 2002-270036, with a machine translation of the document attached) in view of Felten (US Patent 4,598,037) as applied to claim 20 and in further view of Iguchi et al. (US Patent 6,197,480).

With regard to claim 28, Sugiura modified by Felten teach the method of claim 20 (see paragraph 4 above) and Sugiura et al. further teach that the paste may be exposed with ultraviolet (par.0031).

However, Sugiura and Felten fail to teach that the exposure may be performed without a mask.

Iguchi et al. disclose a photosensitive paste including inorganic particles and organic components (abstract). Iguchi et al. further teach a process comprising the following steps:

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- applying the paste to a film (column 12, line 37);
- exposing the paste, preferably with UV light (column 12, lines 45-62);

Iguchi et al. disclose direct pattern formation by means of a red or blue visible laser beam or Ar ion laser beam may be performed instead of using the mask (column 12, lines 51-53).

- developing (column 13, lines 25-27), and
- firing the pattern (column 13, line 55).

It would have been obvious to one of ordinary skill in the art at the time of the invention to perform the direct pattern formation of Iguchi et al. in the process of Sugiura modified by Felten, this type of exposure being clearly taught by Iguchi et al. for a photosensitive paste.

The direct pattern formation step of Sugiura modified by Felten and Iguchi is equivalent to the step of exposure without a mask of claim 28 of the instant application.

7. Claims 31, 33, 34, 36 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiura et al. (JP 2002-270036, with a machine translation of the document attached).

With regard to claim 31, Sugiura et al. teach a photocuring conductor paste comprising:

- 75-90% by weight of a conductive powder material (par.0029 and par.0011), and
- 10-30% by weight of an organic vehicle (par.0029).

The organic vehicle comprises a photopolymerizable compound and a photopolymerization initiator in an amount of 0.1-30% by weight of the photopolymerizable monomer (par.0019 and par.0025). The organic vehicle may also comprise a polymeric binder in an amount of less than 10% by weight of the photopolymerizable monomer (par.0025).

The photopolymerizable monomer of Sugiura et al. is equivalent to the photosensitive monomer of claim 31 and the polymeric binder of Sugiura et al. is equivalent to the polymer of claim 31.

Sugiura et al. do not specifically teach the photosensitive paste of claim 31 of the instant application. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to obtain the paste of claim 31, based on Sugiura's teachings regarding the components of the paste and the amount of each component.

If the photopolymerization initiator is about 10% by weight of the photopolymerizable monomer (see Embodiments 1 and 2 in par.0034-0035) and the binder is 5% by weight of the photopolymerizable monomer (see par.0025), then the organic vehicle comprises:

- 87% by weight of the photopolymerizable monomer,
- 8.7% by weight of the photopolymerization initiator and
- 4.3 % by weight of the binder.

In this case, the ratio of a photopolymerizable monomer /  
(photopolymerizable monomer + binder) = 0.952, which satisfies the limitation of

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the ratio of photosensitive monomer/ (photosensitive monomer + polymer) of 0.90 or more of claim 31.

If the photosensitive paste contains 75% by weight of conductive powder and 25% of the organic vehicle (with 87% by weight of the photopolymerizable monomer, 8.7% by weight of the photopolymerization initiator and 4.3 % by weight of the binder), the paste comprises:

- 75% by weight of conductive powder, which is within the range for conductive powder of claim 31,
- about 22% of the photopolymerizable monomer, which is within the range of claim 31 for a photosensitive monomer;
- about 2% of the photopolymerization initiator, which is within the range of claim 31 for a photopolymerization initiator.

Therefore, the conductor paste of Sugiura et al. is equivalent to the photolithography photosensitive paste of claim 31 of the instant application.

With regard to claim 33, Sugiura et al. teach that the paste may comprise photopolymerizable compounds, such as trimethylolpropane triacrylate, dipentaerythritol pentaacrylate, dipentaerythritol hexaacrylate (par.0021), which are equivalent to the photosensitive monomers having a double bond concentration within the range of 8 to 11 mmol/g.

With regard to claim 34, Sugiura et al. teach that the paste may comprise photopolymerizable compounds such as triethylene glycol diacrylate (par.0021), which meets the limitation for a "photosensitive monomer having an ethylene oxide structure with a degree of polymerization of about 3 or less".

With regard to claim 36, Sugiura et al. teach that the paste is substantially solventless or contains less than 5% by weight of a solvent (par.0009).

With regard to claim 38, Sugiura et al. teach that the paste may comprise photopolymerizable compounds, such as trimethylolpropane triacrylate, dipentaerythritol pentaacrylate, dipentaerythritol hexaacrylate (par.0021). These monomers have double bond concentration within the range of 8 to 11 mmol/g (see page 19 of the specification of the instant application), which overlaps the range of 7.01 to 10.38 mmol/g of claim 37.

The conductive powder of Sugiura et al. is not provided with an inorganic coating (see par.0016-0018).

8. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over as applied to claim 31 above, and further in view of Kubota et al. (US Patent 6,531,247).

With regard to claim 35, Sugiura et al. teach the paste of claim 31 (see paragraph 7 above).

Sugiura et al. further teach that the paste may be exposed with ultraviolet (par.0031) but fail to teach that the paste comprises an UV absorber.

Kubota teaches a photosensitive paste (abstract), wherein the paste may be exposed in ultraviolet with a high-pressure mercury lamp (column 10, lines 1-2).

Kubota teaches that by mixing an ultraviolet absorber, the absorptivity of exposure light can be improved and the exposure failure due to light scattering can be minimized (column 4, lines 29-32).

Therefore, it would have been obvious to include the UV absorber of Kubota in the paste of Sugiura et al, in order to improve the absorptivity of exposure light and to minimize the exposure failure due to light scattering.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ANCA EOFF whose telephone number is (571)272-9810. The examiner can normally be reached on Monday-Thursday, 6:30 AM-4:00 PM, EST and Friday, 6:30-10:30 AM, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia H. Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-

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Representative or access to the automated information system, call 800-786-

9199 (IN USA OR CANADA) or 571-272-1000.

/A. E./

Examiner, Art Unit 1722

/Cynthia H Kelly/

Supervisory Patent Examiner, Art Unit 1722